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Data Paper

Ants from the tropical dry forest in the Cauca River geographic valley, Colombia: new records and expansion of distributions

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Abstract

Background

Tropical dry forests (TDF) are amongst the most important tropical biomes globally, recognised for their remarkable biodiversity. This biome features a favourable climate and high soil fertility, which has facilitated the development and expansion of human societies. However, continuous and extensive human intervention has led to habitat loss and fragmentation, disrupting the assemblages of biological communities. Within these communities, ants (Hymenoptera, Formicidae) represent one of the predominant groups and their high sensitivity to habitat transformation makes them a useful model for monitoring the effects of land-use changes and assessing ecosystem quality. The objective of this research was to compare ant diversity between two habitat types, tropical dry forest fragments and the surrounding matrices in the Cauca River Valley region. Ants were collected from 2021 to 2022 using six collection methods: arboreal baiting, epigeal baiting, hypogeal baiting, pitfall traps, mini-Winkler extractors and manual capture. A

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substantial portion of the data generated from this research is available in two datasets associated with two Colombian entomological collections. The first dataset (1574 ant records) is housed at the Centro de Colecciones Biológicas de la Universidad de Magdalena (CBUMAG) and the second (546 records) at the Museo de Entomología de la Universidad del Valle (MUSENUV).

New information

Five ant species were registered for the first time in Colombia: *Leptogenys montuosa* Lattke, 2011, *Neoponera rugosula* Emery, 1902, *Neoponera zuparkoi* Mackay & Mackay, 2010, *Pheidole traini* Wilson, 2003 and *Wasmannia sulcaticeps* Emery, 1894. Additionally, the distributions of 45 ant species native to two Departments in the Cauca River Valley geographic region (VGRC) have been expanded. Of these, 31 species extended their distribution into the Valle del Cauca Department: *Azteca alfari* Emery, 1893, *Forelius damiani* Guerrero & Fernández, 2008, *Eciton mexicanum* Roger, 1863, *Neivamyrmex emersoni* (Wheeler, 1921), *Holcoponera moelleri* Forel, 1912, *Brachymyrmex musculus* Forel, 1899, *Cephalotes porrasi* (Wheeler, 1942), *Cephalotes targionii* (Emery, 1894), *Cephalotes umbraculatus* (Fabricius, 1804), *Crematogaster montezumia* Smith, 1858, *Crematogaster obscurata* Emery, 1895, *Nesomyrmex pittieri* (Forel, 1899), *Octostruma batesi* (Emery, 1894), *Octostruma excertirugis* Longino, 2013, *Octostruma obtusidens* Longino, 2013, *Pheidole bilimeki* Mayr, 1870, *Pheidole boliviana* Wilson, 2003, *Pheidole colobopsis* Mann, 1916, *Pheidole gauthieri* Forel, 1901, *Pheidole hasticeps* Wilson, 2003, *Pheidole simonsi* Wilson, 2003, *Pheidole subarmata* Mayr, 1884, *Pheidole vallifica* Forel, 1901, *Solenopsis azteca* Forel, 1893, *Solenopsis brevicornis* Emery, 1888, *Strumigenys grytava* (Bolton, 2000), *Strumigenys marginiventris* Santschi, 1931, *Strumigenys wheeleriana* Baroni Urbani, 2007, *Temnothorax subditivus* (Wheeler, 1903), *Hypoponera opacior* (Forel, 1893), *Leptogenys pubiceps* Emery, 1890 and *Pseudomyrmex longior* (Forel, 1904). Ten species extended their distribution into the Cauca Department: *Azteca velox* Forel, 1899, *Brachymyrmex minutus* Forel, 1893, *Crematogaster evallans* Forel, 1907, *Megalomyrmex drifti* Kempf, 1961, *Pheidole fimbriata* Roger, 1863, *Pheidole longiscapa* Forel, 1901, *Pheidole radoszkowskii* Mayr, 1884 and *Rogeria scandens* (Mann, 1922); and four species extended their distribution into both Departments: *Brachymyrmex cordemoyi* Forel, 1895, *Pheidole sculptior* Forel, 1893, *Hypoponera fiebrigi antoniensis* (Forel, 1912) and *Hypoponera parva* (Forel, 1909). Finally, three exotic species were registered for the first time in the VGRC, extending their distributions within Colombia: *Strumigenys emmae* (Emery, 1890) in the Valle del Cauca Department and *Cardiocondyla emeryi* Forel, 1881 and *Cardiocondyla wroughtonii* (Forel, 1890) in the Cauca Department.

Keywords

biodiversity, exotic species, Formicidae, habitat fragmentation, native species, secondary forests

Introduction

The Tropical Dry Forest (TDF) is a key ecosystem, characterised by a distinctive flora and fauna, which results in a unique and differentiated biodiversity (Dirzo R. et al. 2011, Portillo-Quintero et al. 2015, Hernández-Jaramillo et al. 2018). However, it is a seriously threatened ecosystem, with less than 10% of its original extension remaining in many countries in both Latin America and the Caribbean (Dryflor et al. 2016), therefore placing it as one of the most threatened ecosystems worldwide (Janzen 1988).

In Colombia, the situation is even more critical. It is estimated that the TDF originally covered over nine million hectares. Still, today, only about up to 8% of its original extent remains (Arcila Cardona et al. 2012), due to agricultural expansion, as well as the growth of human settlements in the lowlands where TDF is distributed (Pizano and García 2014). Habitat loss and degradation are attributed to continuous human intervention, driven by activities, such as agriculture, livestock farming, deforestation and the establishment and expansion of urban settlements (García Guzmán et al. 2016).

The distribution of the TDF in Colombia is not homogeneous. Currently, there are six major regions distributed throughout Colombian territory (Pizano and García 2014): the Caribbean, the inter-Andean valleys of the Cauca and Magdalena Rivers, the northern Andean Region in Santander including north Santander, the Patía River Valley and in rocky outcrops in the Departments of Arauca and Vichada in the Eastern Plains. This article focuses on the Colombian south-western tropical dry forest, which is located in the geographical valley of the Cauca River (VGRC), a region that has undergone extensive transformations, primarily due to the growth of the agricultural industry. In this area, sugar-cane cultivation has increased by 97% over the past decade (Uribe 2021) and livestock activities continue to dominate the VGRC landscape (Chacón de Ulloa et al. 2012). As a result, the VGRC landscape is characterised by forest remnants covering between 1.5% (Arcila Cardona et al. 2012) and 3% of its original cover (Torres et al. 2012), surrounded by extensive monocultures of sugar-cane and some pastures.

Ants play a fundamental role in ecosystem functioning due to their high specific, genetic, ecological and functional diversity. This diversity involves a broad range of ecological functions, including nutrient cycling, organic matter decomposition, seed dispersal, plant protection, pollination and pest control (Del Toro et al. 2015, Carvalho et al. 2020, Ng et al. 2021). Furthermore, ants are very abundant in most terrestrial ecosystems, both in terms of individuals and biomass (Schultheiss et al. 2022). They also occupy various trophic positions through complex interactions with other organisms (Helms et al. 2020). Their ubiquity and quick response to environmental stressors further reinforces their ecological importance (Parker and Kronauer 2021). Finally, ants are relatively easy to sample and monitor over short time periods (Agosti et al. 2000), a fact that makes them effective models for assessing environmental changes in natural ecosystems.

As noted above, ants are ecologically important to ecosystems through the diversity of functional services they can provide. However, ant communities and their ecosystem services can be affected by habitat loss resulting from landscape transformation and

fragmentation (Arnan et al. 2018). Changes in vegetation structure influence food availability and alter competitive interactions, which can subsequently affect the characteristics and population dynamics of ant species (Hoffmann and Andersen 2003). In addition, not only are interactions between native species affected, but the arrival and establishment of non-native (introduced) ants can also occur, posing additional ecological challenges for local fauna. Changes in land use create favourable conditions for the establishment of these introduced species, which can generate significant impacts on local species (Blumenfeld et al. 2016). It is crucial to emphasise that the establishment and expansion of introduced species depend on their population growth, their ability to acclimatise to new environments and their competitive interactions with native species (Lach L. 2021). Consequently, the study of ants offers important insights into ecological complexity and the impacts of environmental disturbances, elucidating how these factors can transform ecosystem structure and dynamics.

Ant communities in the geographical valley of the Cauca River have been studied from various perspectives (Armbrecht and Chacón de Ulloa 1997, Ramírez et al. 2001, Achury et al. 2008, Chacón de Ulloa et al. 2012, Rivera Pedroza et al. 2019), generating information across spatial and temporal scales. The objective of this study is to assess the diversity and distribution of ant species across several TDF forest fragments and their adjacent productive matrices in the geographical valley of the Cauca River. The results provide valuable insights to to provide information for policy development for the protection, maintenance and conservation of this threatened ecosystem.

Project description

Title: Ant Assemblages: 27 Years of Variation in Fragments of the Cauca Valley Dry Forest and Surrounding Matrices, pertaining to the project "The Dry Forest in Context. Twenty-Five Years Later: Spatio-Temporal Relationships," within the programme "Multi-Scale Relationships in Biodiversity across Altitudinal Gradients in Tropical Forests (Minciencias-Universidad del Valle program code: 70306)".

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Sampling methods

Sampling description: Two sampling sessions were conducted at seven sites in the geographic valley of the Cauca River in Colombia. At each site, two types of habitats were sampled: a fragment of tropical dry forest (TDF) and its adjacent anthropogenic matrix. Of the seven sampled sites, three matrices consisted of industrialised sugar-cane crops, while four matrices corresponded to pastures (Table 1). At each site, four 90-metre transects were installed — two transects within the forest and two within the matrix. In the

forest, transects were placed starting 20 m from the forest edge, whereas, in the matrix, transects were set 20 m from the matrix edge to control for edge effects. Within each habitat type, the two transects were separated by 70 m.

Table 1.

Description, altitude and coordinates of the sampled sites in the geographic valley of the Cauca River. The sites are ordered from south to north. Industrialised sugar-cane is defined as large-scale agricultural fields that use heavy machinery and chemical inputs. Treed pastures contained trees more than three decades old, approximately 60 trees/hectare. Open pasture contained sporadic trees or lacked tree coverage. Regenerating pastures contained approximately 60 trees/hectare from one to six metres.

Note: *The geographic coordinates of Hacienda Las Pilas seem to correspond to the County of La Victoria; however, this site has historically been documented as pertaining to the County of Zarzal, Valle del Cauca.

Site	County	Department	Elevation (m)	Latitude	Longitude	Anthropogenic Matrix
Hacienda Nanaluisa San Julián	Santander de Quilichao	Cauca	954	3.10961	−76.52658	Industrialised sugar-cane
Reserva de la Sociedad Civil Bosque Colindres	Jamundí	Valle del Cauca	970	3.26714	−76.48661	Industrialised sugar-cane
Reserva Natural El Hatico	El Cerrito	Valle del Cauca	988	3.64189	−76.32537	Treed pasture
Parque Natural Regional El Vínculo	Guadalajara de Buga	Valle del Cauca	983	3.83600	−76.29830	Treed pasture
Bosque Seco Tropical Inundable De Las Chatas (humedal continental)	Guadalajara de Buga	Valle del Cauca	943	3.85681	−76.33067	Regenerating pasture
Hacienda El Medio	Zarzal	Valle del Cauca	943	4.33481	−76.08081	Industrialised sugar-cane
Hacienda Las Pilas*	Zarzal	Valle del Cauca	991	4.44062	−75.99042	Open pasture

Each transect was divided into 10 equidistant stations and, at each station, six types of collection methods were employed as follows: (1) subterranean baiting, which involved placing bait inside a perforated Eppendorf tube buried 10 cm in the soil; (2) ground baiting, which consisted of a 20 × 10 cm piece of bond paper with bait on its surface, exposed on the ground; (3) arboreal baiting, similar to ground baiting, but with the bait folded within the paper and attached to a tree trunk or shrub (all baits consisted of approximately 1 cm^3 of tuna in oil); (4) pitfall traps, consisting of a 170 ml cup buried flush with the ground and containing a solution with a 50:50 ratio of ethanol to water (both the baits and pitfall traps were left in place for 4.5 hours); (5) Mini-winkler, this consisted of collecting five litter samples covering each 1 m^2 around each station, i.e. five points on the periphery of the station were located, then the litter was placed in the sifting bag. The

sifted litter was placed in a mini-winkler bag, leaving it to act for 48 hours; and (6) manual collection, which involved a six-minute search per station across all substrates.

Two sampling efforts were performed for each site, each occurring in the transition from dry season to rainy season. The first sampling phase took place between July and September 2021, while the second phase occurred between January and March 2022.

Quality control: All collected ants were preserved in 96% alcohol, cleaned and identified to the level of species or morphospecies using an Olympus SZ61 stereoscope. For specimen identification, keys from Fernández et al. (2019) and the interactive LucidKey v.3.3 (Longino 2009), as well as online resources such as AntWeb (2024) and AntWiki (2024), were used. A portion of the specimens were pinned as a reference collection and deposited in the Museo de Entomología de la Universidad del Valle (MUSENUV). Given the large quantity of collected material, another portion was deposited at the Centro de Colecciones Biológicas de la Universidad de Magdalena (CBUMAG). All samples were collected under the general collection permit, Resolution 1070 of 28 August 2015, modified by Resolution 01255 of 28 June 2019, file IDB 0436-00.

Geographic coverage

Description: The study was conducted at seven sites composed of forest fragments and adjacent anthropogenic matrices. These sites are located in south-western Colombia, throughout the geographic valley of the Cauca River (VGRC), between coordinates 3.10961 to 4.44062 and −76.52658 to −75.99042 (Fig. 1). The VGRC is an inter-Andean alluvial plain situated between the Central and Western mountain ranges (Reina Rodríguez et al. 2010). The valley is 230 km long and 10–20 km wide, with an elevation above sea level between 900 and 1200 m, an average temperature of 24°C and annual rainfall ranging from 1000 to 2000 mm (Arcila Cardona et al. 2012).

The area falls within the potential range of tropical dry forest (i.e. the site has the appropriate climatic conditions for TDF, but it does not necessarily retain its original vegetation), characterised by two rainy seasons (March–May and September–November) and two dry seasons (December–January and June–August) (Cuartas et al. 2017). It includes flood-prone areas and clayey soils favourable for agriculture, making it the main region in the Department for urban settlement and agro-industrial development (Urrutia 2005), particularly for sugar-cane cultivation and livestock farming activities.

Taxonomic coverage

Description: The dataset includes 25,022 individual ants across 2,120 records, distributed within two datasets: 24,476 individuals in 1574 records in the CBUMAG dataset and 546 individuals and records in the MUSENUV dataset (both are in accordance with the Darwin Core 4.0 format). In total, 229 species/morphospecies are

reported, covering 54 genera and nine subfamilies. Of these, 124 species are shared across both databases, while 17 species are exclusive to the CBUMAG dataset and 88 to the MUSENUV dataset (Table 2). Of the 229 taxa, 81% were designated to species level and 19% to morphospecies level. Amongst the 186 identified species, 168 are native and nine are exotic species, which include *C. emeryi*, *C. wroughtonii*, *Monomorium floricola* (Jerdon, 1851), *Paratrechina longicornis* (Latreille, 1802), *Pheidole megacephala* (Fabricius, 1793), *S. emmae*, *Strumigenys rogeri* Emery, 1890, *Tapinoma melanocephalum* (Fabricius, 1793) and *Tetramorium bicarinatum* (Nylander, 1846) (Table 2).

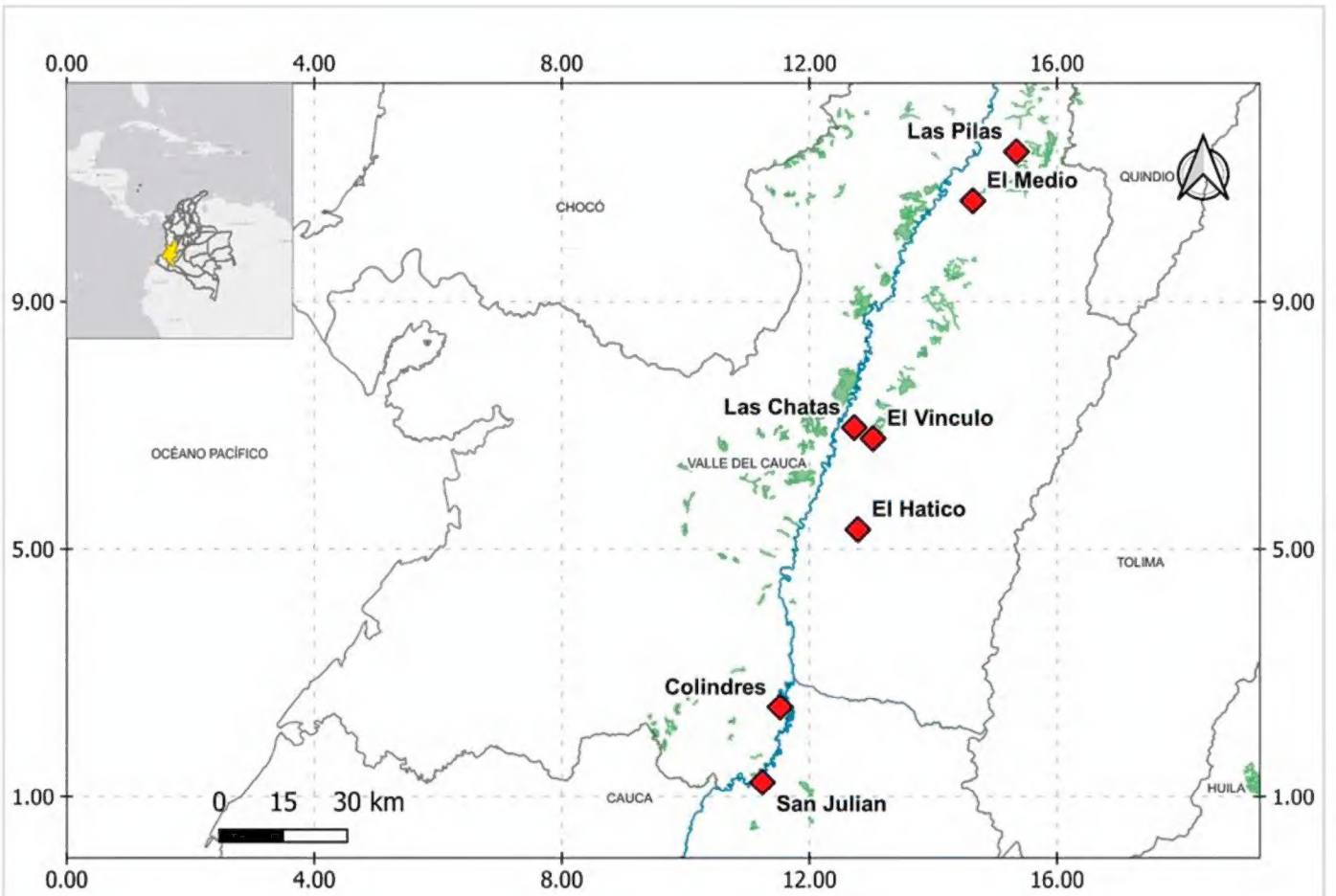

Figure 1. doi

Location of the seven study sites in the geographic valley of the Cauca River. The blue line corresponds to the Cauca River and the green areas correspond to tropical dry forest (TDF). This map was created for this study.

Some species, such as *Prionopelta amabilislantillana*, *Azteca tonduzilchartifex* and *Solenopsis texanalzeteki*, could not be identified with a single specific epithet due to the lack of distinctive morphological characters in the available taxonomic keys. For other species, such as *Apterostigma* aff. *manni*, *Camponotus* aff. *cuneidorsus*, *Camponotus* aff. *pittieri*, *Brachymyrmex* aff. *degener*, *Hypoponera* aff. *clavatula*, *Monomorium* aff. *ebeninum*, *Pheidole* aff. *angulifera*, *Pheidole* aff. *diligens*, *Pheidole* aff. *jamaicensis*, *Pheidole* aff. *rugiceps*, *Pseudomyrmex* aff. *venustus*, *Rogeria* aff. *curvipubens*, *Solenopsis* aff. *hayemi* and *Solenopsis* aff. *tenuis*, taxonomic identities also remain unconfirmed, primarily due to morphological variations that do not match with established characters. Confirming the identities of these ants could represent new records for

Colombia or potential range expansions of these species, which would contribute to more robust distribution models for Colombian ant fauna, enhance our understanding of ant biodiversity and significantly increase the recorded species richness in the country. Therefore, additional efforts are essential to clarify and confirm the taxonomic identity of these ants and expand available taxonomic resources.

Table 2.

Species and morphospecies correspond to each of the registered ant genera and subfamilies. Species in bold and labelled with ** indicate new records for Colombia. The collections where the specimens are deposited are identified with the following acronyms: CBUMAG (Centro de Colecciones Biológicas at the Universidad del Magdalena), MUSENUV (Museo de Entomología at the Universidad del Valle) and CBUMAG/MUSENUV for those deposited in both collections. Biogeographic status is classified as native, exotic or uncertain; in the case of morphospecies, the status of the morphologically similar species was considered. In those cases where a morphospecies could not be defined, the taxonomic identity of the genus was considered. The Departments where the specimens are found are indicated as follows: VC = Valle del Cauca, C = Cauca and * indicates a distribution expansion for the Departments.

Subfamily	**Genus**	**Species or morphospecies**	**Collection**	**Biogeographic status**	**Distribution in the TDF sampled**
Agroecomyrmecinae	*Tatuidris*	*Tatuidris tatusia* Brown & Kempf, 1968	CBUMAG/ MUSENUV	Native	VC
Amblyoponinae	*Prionopelta*	*Prionopelta amabilis/ antillana*	CBUMAG/ MUSENUV	Native	VC
		Prionopelta sp. 1	MUSENUV	Native	C
Dolichoderinae	*Azteca*	*Azteca alfari* Emery, 1893	CBUMAG/ MUSENUV	Native	VC*
		Azteca velox Forel, 1899	CBUMAG/ MUSENUV	Native	VC, C*
		Azteca tonduzi/ chartifex	CBUMAG/ MUSENUV	Native	VC
	Dolichoderus	*Dolichoderus bispinosus* (Olivier, 1792)	CBUMAG/ MUSENUV	Native	VC
		Dolichoderus diversus Emery, 1894	MUSENUV	Native	VC
		Dolichoderus lutosus (Smith, 1858)	CBUMAG	Native	VC

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
	Dorymyrmex	*Dorymyrmex brunneus* Forel, 1908	MUSENUV	Native	VC
	Forelius	*Forelius damiani* Guerrero & Fernández, 2008	CBUMAG/ MUSENUV	Native	VC*
	Linepithema	*Linepithema iniquum* (Mayr, 1870)	CBUMAG/ MUSENUV	Native	VC, C
		Linepithema neotropicum Wild, 2007	CBUMAG	Native	VC
	Tapinoma	*Tapinoma melanocephalum* (Fabricius, 1793)	MUSENUV	Exotic	C
		Tapinoma ramulorum Emery, 1896	MUSENUV	Native	VC
Dorylinae	*Eciton*	*Eciton mexicanum* Roger, 1863	MUSENUV	Native	VC*
	Labidus	*Labidus coecus* (Latreille, 1802)	CBUMAG/ MUSENUV	Native	VC
		Labidus spininodis (Emery, 1890)	CBUMAG/ MUSENUV	Native	VC
	Neivamyrmex	*Neivamyrmex emersoni* (Wheeler, 1921)	MUSENUV	Native	VC*
	Nomamyrmex	*Nomamyrmex hartigii* (Westwood, 1842)	MUSENUV	Native	VC
Ectatomminae	*Ectatomma*	*Ectatomma ruidum* (Roger, 1860)	CBUMAG/ MUSENUV	Native	VC
	Gnamptogenys	*Gnamptogenys annulata* (Mayr, 1887)	CBUMAG/ MUSENUV	Native	VC
		Gnamptogenys horni (Santschi, 1929)	CBUMAG	Native	VC
	Holcoponera	*Holcoponera moelleri* Forel, 1912	CBUMAG/ MUSENUV	Native	VC*

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
Formicinae	*Acropyga*	*Acropyga exsanguis* (Wheeler, 1909)	CBUMAG/ MUSENUV	Native	VC, C
		Acropyga fuhrmanni (Forel, 1914)	CBUMAG/ MUSENUV	Native	VC
	Brachymyrmex	*Brachymyrmex australis* Forel, 1901	CBUMAG/ MUSENUV	Native	VC
		Brachymyrmex cordemoyi Forel, 1895	CBUMAG/ MUSENUV	Native	VC*, C*
		Brachymyrmex minutus Forel, 1893	CBUMAG/ MUSENUV	Native	VC, C*
		Brachymyrmex musculus Forel, 1899	CBUMAG/ MUSENUV	Native	VC*
		Brachymyrmex obscurior Forel, 1893	CBUMAG/ MUSENUV	Native	VC
		Brachymyrmex aff. *degener*	MUSENUV	Native	VC
	Camponotus	*Camponotus atriceps* (Smith, 1858)	CBUMAG/ MUSENUV	Native	VC
		Camponotus bidens Mayr, 1870	CBUMAG/ MUSENUV	Native	VC
		Camponotus brevis Forel, 1899	CBUMAG/ MUSENUV	Native	VC
		Camponotus excisus Mayr, 1870	CBUMAG/ MUSENUV	Native	VC
		Camponotus indianus Forel, 1879	CBUMAG/ MUSENUV	Native	VC, C
		Camponotus lindigi Mayr, 1870	CBUMAG/ MUSENUV	Native	VC, C
		Camponotus linnaei Forel, 1886	MUSENUV	Native	VC
		Camponotus novogranadensis Mayr, 1870	CBUMAG/ MUSENUV	Native	VC

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
		Camponotus senex (Smith, 1858)	CBUMAG/ MUSENUV	Native	VC, C
		Camponotus aff. *cuneidorsus*	MUSENUV	Native	VC
		Camponotus aff. *pittieri*	MUSENUV	Native	VC
		Camponotus sp. 1	MUSENUV	Native	VC, C
		Camponotus sp. 2	MUSENUV	Native	VC
		Camponotus sp. 3	MUSENUV	Native	VC
		Camponotus sp. 4	MUSENUV	Native	VC
		Camponotus sp. 5	MUSENUV	Native	VC
		Camponotus sp. 6	MUSENUV	Native	C
		Camponotus sp. 7	MUSENUV	Native	VC
		Camponotus sp. 8	MUSENUV	Native	VC
	Nylanderia	*Nylanderia guatemalensis* (Forel, 1885)	CBUMAG/ MUSENUV	Native	VC
		Nylanderia steinheili (Forel, 1893)	CBUMAG	Native	VC
		Nylanderia sp. 1	MUSENUV	Native	VC
	Paratrechina	*Paratrechina longicornis* (Latreille, 1802)	CBUMAG/ MUSENUV	Exotic	VC, C
Myrmicinae	*Acanthognathus*	*Acanthognathus brevicornis* Smith, 1944	CBUMAG/ MUSENUV	Native	VC
		Acanthognathus ocellatus Mayr, 1887	CBUMAG/ MUSENUV	Native	VC, C
		Acanthognathus teledectus Brown & Kempf, 1969	MUSENUV	Native	VC

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
	Apterostigma	*Apterostigma carinatum* Lattke, 1997	CBUMAG/ MUSENUV	Native	VC
		Apterostigma pilosum	CBUMAG/ MUSENUV	Native	VC
		Apterostigma aff. *manni*	MUSENUV	Native	VC
	Atta	*Atta cephalotes* (Linnaeus, 1758)	CBUMAG/ MUSENUV	Native	VC
	Cardiocondyla	*Cardiocondyla emeryi* Forel, 1881	CBUMAG/ MUSENUV	Exotic	VC, C*
		Cardiocondyla nuda (Mayr, 1866)	CBUMAG/ MUSENUV	Uncertain	VC
		Cardiocondyla wroughtonii (Forel, 1890)	CBUMAG/ MUSENUV	Exotic	VC, C*
	Carebara	*Carebara brevipilosa* Fernández, 2004	CBUMAG/ MUSENUV	Native	VC
	Cephalotes	*Cephalotes basalis* (Smith, 1876)	CBUMAG/ MUSENUV	Native	VC
		Cephalotes cristatus (Emery, 1890)	MUSENUV	Native	VC
		Cephalotes maculatus (Smith, 1876)	CBUMAG/ MUSENUV	Native	VC
		Cephalotes minutus (Fabricius, 1804)	CBUMAG/ MUSENUV	Native	VC
		Cephalotes porrasi (Wheeler, 1942)	MUSENUV	Native	VC*
		Cephalotes targionii (Emery, 1894)	MUSENUV	Native	VC*
		Cephalotes umbraculatus (Fabricius, 1804)	MUSENUV	Native	VC*

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
	Crematogaster	*Crematogaster abstinens* Forel, 1899	CBUMAG/ MUSENUV	Native	VC
		Crematogaster ampla Forel, 1912	CBUMAG/ MUSENUV	Native	VC
		Crematogaster brasiliensis Mayr, 1878	CBUMAG/ MUSENUV	Native	VC
		Crematogaster carinata Mayr, 1862	CBUMAG/ MUSENUV	Native	VC
		Crematogaster crinosa Mayr, 1862	CBUMAG/ MUSENUV	Native	VC
		Crematogaster curvispinosa Mayr, 1862	CBUMAG/ MUSENUV	Native	VC, C
		Crematogaster distans Mayr, 1870	MUSENUV	Native	VC
		Crematogaster erecta Mayr, 1866	MUSENUV	Native	VC
		Crematogaster evallans Forel, 1907	CBUMAG/ MUSENUV	Native	VC, C*
		Crematogaster montezumia Smith, 1858	CBUMAG/ MUSENUV	Native	VC*
		Crematogaster nigropilosa Mayr, 1870	CBUMAG/ MUSENUV	Native	VC
		Crematogaster obscurata Emery, 1895	MUSENUV	Native	VC*
		Crematogaster sotobosque Longino, 2003	CBUMAG/ MUSENUV	Native	VC
		Crematogaster tenuicula Forel, 1904	CBUMAG/ MUSENUV	Native	VC

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
		Crematogaster torosa Mayr, 1870	CBUMAG/ MUSENUV	Native	VC
	Cyphomyrmex	*Cyphomyrmex costatus* Mann, 1922	CBUMAG/ MUSENUV	Native	VC
		Cyphomyrmex minutus Mayr, 1862	CBUMAG/ MUSENUV	Native	VC, C
		Cyphomyrmex rimosus (Spinola, 1851)	CBUMAG/ MUSENUV	Native	VC, C
	Hylomyrma	*Hylomyrma* sp. 1	MUSENUV	Native	VC
	Megalomyrmex	*Megalomyrmex drifti* Kempf, 1961	CBUMAG/ MUSENUV	Native	VC, C*
		Megalomyrmex sp. 1	MUSENUV	Native	VC
		Megalomyrmex sp. 2	MUSENUV	Native	VC
		Megalomyrmex sp. 3	MUSENUV	Native	VC
	Monomorium	*Monomorium floricola* (Jerdon, 1851)	CBUMAG/ MUSENUV	Exotic	VC, C
		Monomorium aff. *ebeninum*	MUSENUV	Uncertain	VC
	Mycetomoellerius	*Mycetomoellerius opulentus* (Mann, 1922)	CBUMAG/ MUSENUV	Native	VC
	Mycocepurus	*Mycocepurus smithii* (Forel, 1893)	CBUMAG	Native	VC
	Nesomyrmex	*Nesomyrmex asper* (Mayr, 1887)	CBUMAG/ MUSENUV	Native	VC
		Nesomyrmex echinatinodis (Forel, 1886)	CBUMAG/ MUSENUV	Native	VC, C
		Nesomyrmex pittieri (Forel, 1899)	MUSENUV	Native	VC*
	Octostruma	*Octostruma balzani* (Emery, 1894)	CBUMAG/ MUSENUV	Native	VC

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
		Octostruma batesi (Emery, 1894)	CBUMAG/ MUSENUV	Native	VC*
		Octostruma excertirugis Longino, 2013	MUSENUV	Native	VC*
		Octostruma obtusidens Longino, 2013	MUSENUV	Native	VC*
		Octostruma sp. 3	MUSENUV	Native	VC
		Octostruma sp. 4	MUSENUV	Native	VC
		Octostruma sp. 5	MUSENUV	Native	VC
	Paratrachymyrmex	*Paratrachymyrmex cornetzi* (Forel, 1912)	CBUMAG/ MUSENUV	Native	VC, C
	Pheidole	*Pheidole biconstricta* Mayr, 1870	CBUMAG/ MUSENUV	Native	VC
		Pheidole bilimeki Mayr, 1870	CBUMAG/ MUSENUV	Native	VC*
		Pheidole boliviana Wilson, 2003	CBUMAG/ MUSENUV	Native	VC*
		Pheidole cataractae Wheeler, 1916	CBUMAG/ MUSENUV	Native	VC
		Pheidole colobopsis Mann, 1916	MUSENUV	Native	VC*
		Pheidole fimbriata Roger, 1863	CBUMAG/ MUSENUV	Native	VC, C*
		Pheidole flavens Roger, 1863	CBUMAG/ MUSENUV	Native	VC, C
		Pheidole gauthieri Forel, 1901	CBUMAG/ MUSENUV	Native	VC*
		Pheidole hasticeps Wilson, 2003	MUSENUV	Native	VC*
		Pheidole longiscapa Forel, 1901	CBUMAG/ MUSENUV	Native	VC, C*

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
		Pheidole megacephala (Fabricius, 1793)	CBUMAG/ MUSENUV	Exotic	VC
		Pheidole radoszkowskii Mayr, 1884	CBUMAG/ MUSENUV	Native	VC, C*
		Pheidole sculptior Forel, 1893	CBUMAG/ MUSENUV	Native	VC*, C*
		Pheidole seeldrayersi Forel, 1910	MUSENUV	Native	VC
		Pheidole simonsi Wilson, 2003	CBUMAG/ MUSENUV	Native	VC*
		Pheidole subarmata Mayr, 1884	CBUMAG/ MUSENUV	Native	VC*
		Pheidole susannae Forel, 1886	CBUMAG/ MUSENUV	Native	VC
		Pheidole synarmata Wilson, 2003	CBUMAG/ MUSENUV	Native	VC
		Pheidole traini ** Wilson, 2003	MUSENUV	Uncertain	VC
		Pheidole transversostriata Mayr, 1887	CBUMAG	Native	VC
		Pheidole vallifica Forel, 1901	CBUMAG/ MUSENUV	Native	VC*
		Pheidole aff. *angulifera*	CBUMAG/ MUSENUV	Native	VC
		Pheidole aff. *diligens*	MUSENUV	Native	VC
		Pheidole aff. *jamaicensis*	MUSENUV	Uncertain	C
		Pheidole aff. *rugiceps*	CBUMAG/ MUSENUV	Native	VC, C
		Pheidole sp. 11	MUSENUV	Native	C
		Pheidole sp. 20	MUSENUV	Native	VC

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
		Pheidole sp. 21	MUSENUV	Native	VC
		Pheidole sp. 27	MUSENUV	Native	VC
		Pheidole sp. 33	MUSENUV	Native	VC
		Pheidole sp. 34	MUSENUV	Native	VC
	Procryptocerus	*Procryptocerus ferreri* Forel, 1912	MUSENUV	Native	VC
		Procryptocerus scabriusculus Forel, 1899	CBUMAG/ MUSENUV	Native	VC
	Rogeria	*Rogeria foreli* Emery, 1894	CBUMAG/ MUSENUV	Native	VC, C
		Rogeria gibba Kugler, 1994	CBUMAG/ MUSENUV	Native	VC
		Rogeria scandens (Mann, 1922)	CBUMAG/ MUSENUV	Native	VC, C*
		Rogeria aff. *curvipubens*	MUSENUV	Native	VC
	Solenopsis	*Solenopsis azteca* Forel, 1893	CBUMAG/ MUSENUV	Native	VC*, C
		Solenopsis bicolor (Emery, 1906)	CBUMAG/ MUSENUV	Native	VC, C
		Solenopsis brevicornis Emery, 1888	CBUMAG/ MUSENUV	Native	VC*, C
		Solenopsis geminata (Fabricius, 1804)	CBUMAG	Native	VC
		Solenopsis picea Emery, 1896	CBUMAG/ MUSENUV	Native	VC
		Solenopsis rugiceps Mayr, 1870	MUSENUV	Native	VC
		Solenopsis stricta Emery, 1896	CBUMAG/ MUSENUV	Native	VC

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
		Solenopsis vinsoni Pacheco & Mackay, 2013	CBUMAG/ MUSENUV	Native	VC
		Solenopsis aff. *hayemi*	MUSENUV	Native	VC
		Solenopsis aff. *tenuis*	MUSENUV	Native	VC, C
		Solenopsis texanal zeteki	CBUMAG/ MUSENUV	Native	VC, C
		Solenopsis sp. 9	MUSENUV	Native	VC
	Strumigenys	*Strumigenys biolleyi* Forel, 1908	CBUMAG/ MUSENUV	Native	VC, C
		Strumigenys denticulata Mayr, 1887	CBUMAG	Native	VC
		Strumigenys eggersi Emery, 1890	CBUMAG/ MUSENUV	Native	VC
		Strumigenys emmae (Emery, 1890)	MUSENUV	Exotic	VC*
		Strumigenys grytava (Bolton, 2000)	MUSENUV	Native	VC*
		Strumigenys gundlachi (Roger, 1862)	CBUMAG/ MUSENUV	Native	VC, C
		Strumigenys louisianae Roger, 1863	CBUMAG	Native	VC
		Strumigenys marginiventris Santschi, 1931	CBUMAG	Native	VC*
		Strumigenys perparva Brown, 1958	CBUMAG/ MUSENUV	Native	VC
		Strumigenys rogeri Emery, 1890	CBUMAG	Exotic	C

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
		Strumigenys smithii Forel, 1886	MUSENUV	Native	VC
		Strumigenys subedentata Mayr, 1887	CBUMAG/ MUSENUV	Native	VC
		Strumigenys trinidadensis Wheeler, 1922	CBUMAG/ MUSENUV	Native	VC, C
		Strumigenys wheeleriana Baroni Urbani, 2007	MUSENUV	Native	VC*
		Strumigenys zeteki (Brown, 1959)	CBUMAG/ MUSENUV	Native	VC
	Temnothorax	*Temnothorax subditivus* (Wheeler, 1903)	MUSENUV	Native	VC*
	Tetramorium	*Tetramorium bicarinatum* (Nylander, 1846)	CBUMAG/ MUSENUV	Exotic	VC, C
	Tranopelta	*Tranopelta gilva* Mayr, 1866	CBUMAG/ MUSENUV	Native	VC
	Wasmannia	*Wasmannia auropunctata* (Roger, 1863)	CBUMAG	Native	VC, C
		Wasmannia sulcaticeps ** Emery, 1894	MUSENUV	Uncertain	VC
Ponerinae	*Anochetus*	*Anochetus diegensis* Forel, 1912	MUSENUV	Native	VC
		Anochetus mayri Emery, 1884	CBUMAG/ MUSENUV	Native	VC, C
	Hypoponera	*Hypoponera distinguenda* (Emery, 1890)	CBUMAG	Native	VC

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
		Hypoponera fiebrigi antoniensis (Forel, 1912)	CBUMAG/ MUSENUV	Native	VC*, C*
		Hypoponera foeda (Forel, 1893)	MUSENUV	Native	VC
		Hypoponera opaciceps (Mayr, 1887)	CBUMAG/ MUSENUV	Native	VC
		Hypoponera opacior (Forel, 1893)	CBUMAG/ MUSENUV	Native	VC*
		Hypoponera parva (Forel, 1909)	CBUMAG/ MUSENUV	Native	VC*, C*
		Hypoponera trigona (Mayr, 1887)	CBUMAG/ MUSENUV	Native	VC
		Hypoponera aff *clavatula*	MUSENUV	Native	VC
	Leptogenys	***Leptogenys montuosa*** ** Lattke, 2011	MUSENUV	Uncertain	VC
		Leptogenys pubiceps Emery, 1890	MUSENUV	Native	VC*
	Mayaponera	*Mayaponera constricta* (Mayr, 1884)	CBUMAG/ MUSENUV	Native	VC
		Mayaponera sp. 1	MUSENUV	Native	VC
	Neoponera	*Neoponera apicalis* (Latreille, 1802)	MUSENUV	Native	VC
		Neoponera carinulata (Roger, 1861)	CBUMAG/ MUSENUV	Native	VC
		Neoponera crenata (Roger, 1861)	CBUMAG/ MUSENUV	Native	VC
		Neoponera foetida (Linnaeus, 1758)	MUSENUV	Native	VC
		Neoponera moesta Mayr, 1870	MUSENUV	Native	VC

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
		Neoponera rugosula* Emery, 1902	CBUMAG/ MUSENUV	Uncertain	VC, C
		Neoponera unidentata Mayr, 1862	MUSENUV	Native	VC
		Neoponera zuparkoi* Mackay & Mackay, 2010	CBUMAG	Uncertain	VC
		Neoponera verenae (Forel, 1922)	CBUMAG/ MUSENUV	Native	VC, C
	Odontomachus	*Odontomachus chelifer* (Latreille, 1802)	CBUMAG/ MUSENUV	Native	VC
		Odontomachus erythrocephalus Emery, 1890	CBUMAG/ MUSENUV	Native	VC
		Odontomachus haematodus (Linnaeus, 1758)	MUSENUV	Native	C
		Odontomachus ruginodis Smith, 1937	CBUMAG	Native	VC
	Pachycondyla	*Pachycondyla harpax* (Fabricius, 1804)	CBUMAG/ MUSENUV	Native	VC
		Pachycondyla impressa (Roger, 1861)	CBUMAG	Native	VC
	Thaumatomyrmex	*Thaumatomyrmex atrox* Weber, 1939	MUSENUV	Native	VC
Pseudomyrmecinae	*Pseudomyrmex*	*Pseudomyrmex boopis* (Roger, 1863)	MUSENUV	Native	VC
		Pseudomyrmex elongatus (Mayr, 1870)	CBUMAG/ MUSENUV	Native	VC

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
		Pseudomyrmex filiformis (Fabricius, 1804)	CBUMAG/ MUSENUV	Native	VC
		Pseudomyrmex gebellii (Forel, 1899)	MUSENUV	Native	VC
		Pseudomyrmex gracilis (Fabricius, 1804)	CBUMAG/ MUSENUV	Native	VC
		Pseudomyrmex ita (Forel, 1906)	MUSENUV	Native	VC
		Pseudomyrmex kuenckeli (Emery, 1890)	CBUMAG/ MUSENUV	Native	VC
		Pseudomyrmex longior (Forel, 1904)	MUSENUV	Native	VC*
		Pseudomyrmex longus (Forel, 1912)	MUSENUV	Native	VC
		Pseudomyrmex oculatus (Smith, 1855)	CBUMAG	Native	VC
		Pseudomyrmex oki (Forel, 1906)	MUSENUV	Native	VC
		Pseudomyrmex pallens (Mayr, 1870)	MUSENUV	Native	VC
		Pseudomyrmex simplex (Smith, 1877)	CBUMAG/ MUSENUV	Native	VC
		Pseudomyrmex tenuissimus (Emery, 1906)	CBUMAG/ MUSENUV	Native	VC
		Pseudomyrmex termitarius (Smith, 1855)	CBUMAG/ MUSENUV	Native	VC, C
		Pseudomyrmex psw005	MUSENUV	Native	VC

Subfamily	Genus	Species or morphospecies	Collection	Biogeographic status	Distribution in the TDF sampled
		Pseudomyrmex psw015	MUSENUV	Native	VC
		Pseudomyrmex aff. psw005	MUSENUV	Native	VC
		Pseudomyrmex aff. *venustus*	MUSENUV	Native	VC
TOTAL		229			

In addition to previously reported exotic species in the Departments studied, we identified a range expansion of *Strumigenys emmae* (Emery, 1890) in the Department of Valle del Cauca, as well as *Cardiocondyla wroughtonii* (Forel, 1890) and *Cardiocondyla emeryi* Forel, 1881 in the Department of Cauca. The record of *S. emmae* comes from the Colindres site, located in a municipality bordering northern Cauca, where this species had already been reported (Guerrero et al. 2018), suggesting a possible range expansion into Valle del Cauca. Similarly, *C. wroughtonii* and *C. emeryi*, previously reported in Valle del Cauca (Mackay 1995, Chacón de Ulloa et al. 2012), were found in Cauca, expanding their known distributions. Additionally, although *Pheidole megacephala* had been previously reported in urban areas of Valle del Cauca (Fernández et al. 2019), we now report its presence in natural ecosystems, such as forest fragments, as well as in the surrounding anthropogenic matrices. Therefore, it is necessary to closely monitor the presence of this exotic species across different habitat types to understand the potential impact of that species on native biological diversity.

Overall, nine exotic species were recorded in the Cauca River Valley region (VGRC), indicating an increasing presence of non-native ants in this area. These findings highlight the importance of continued research on the distribution and population dynamics of exotic species, as well as the dissemination of such information, since many of these ants have high invasive potential (e.g. *Pheidole megacephala*) (Lowe et al. 2004) and may pose significant threats to local biodiversity. Monitoring their dispersal and establishment patterns (i.e. potential naturalisation) is essential to prevent and mitigate possible ecological impacts.

Usage licence

Usage licence: Other

IP rights notes: CC BY-NC 4.0

Data resources

Data package title: Ants from the tropical dry forest in the Cauca River Geographic Valley, Colombia: new records and expansion of distributions

Resource link: https://www.gbif.org/dataset/d63054b1-2900-4230-9fb2-83a60b772d49 https://www.gbif.org/dataset/3cce7a63-aa6e-412c-a694-26947ab238c7

Number of data sets: 2

Data set name: Ants from Tropical Dry Forests and their surrounding matrices in the geographical valley of the Cauca River, which are deposited in the entomological collection of the Universidad del Magdalena.

Character set: Occurrence

Download URL: https://ipt.biodiversidad.co/sib/archive.do?r=umagdalena_hormigas-bosqueseco

Data format: Darwin Core Archive

Description: The dataset contains 1,574 records of ants and was published in the SiB Colombia as an open file under the Creative Commons Attribution 4.0 International licence. The terms used to name the fields follow the standard Darwin Core (Wieczorek et al. 2012, Darwin Core Maintenance Group 2023).

Data set name: Ants from Tropical Dry Forests and their surrounding matrices in the geographical valley of the Cauca River, which are deposited in the entomological collection of the Universidad de Valle.

Character set: Occurrence

Download URL: https://ipt.biodiversidad.co/sib/archive.do?r=univalle_hormigas_bosque-seco

Data format: Darwin Core Archive

Description: The dataset contains 546 records of ants and was published in the SiB Colombia as an open file under the Creative Commons Attribution 4.0 International licence. The terms used to name the fields follow the standard Darwin Core (Wieczorek et al. 2012, Darwin Core Maintenance Group 2023).

Below, following the Darwin Core version 4.0 record template, we list the columns and their descriptions used in both datasets. When downloading the files, two text documents will be available: "occurrence," which contains all Darwin Core columns, except those related to permits and "permit" which includes only the permit-related columns: *permitType*, *permitStatus* and *permitText*.

Column label	Column description
ocurrenceID	Unique identifier of the biological record.
basisOfRecord	Denotes the evidence from which the organism was derived. Only biological collections can document PreservedSpecimen.
type	Specifies the type of evidence that gave rise to the record.
institutionCode	Complete name of the institution that houses the specimens.
institutionID	Institution identifier registered in the institutionCode element.
collectionCode	Name or acronym that identifies the collection housing the records.
collectionID	Identifier of the collection that houses the records.
catalogNumber	Unique identifier assigned to the batch or specimen in the biological collection.
datasetName	Name of the dataset from which the biological records derive.
language	Language of the dataset.
recordNumber	Identifier of the biological record at the moment it was collected.
recordedBy	List of the names of the people, groups or organisations that collected the specimens.
recordedByID	List of the IDs of the people, groups or organisations registered in recordedBy.
individualCount	Number of individuals in the biological record.
sex	Sex of the organisms in the biological record.
lifeStage	Life stage of the organism when registered.
occurrenceStatus	Status indicating the presence or absence of specimens in the collection.
preparations	Conservation methods of the specimens.
disposition	Current status of the specimen in relation to the collection that houses the records.
samplingProtocol	Sampling protocol of the biological record.
eventDate	Date or date range when the specimens were collected or the sampling event took place. This includes additional columns, such as year, month and day.
habitat	Habitat or description of the habitat where the specimens were collected.
continent	Name of the continent where the specimens were collected.
country	Name of the country where the specimens were collected.
countryCode	Standard code for the country of the location.
stateProvince	Full name of the next administrative region of lower hierarchy in the country where the specimens were collected (Department).
county	Full name of the next administrative region of lower hierarchy after Department.

locality	More specific geographic information on where the specimens were collected.
minimumElevationInMetres	Lower limit of the elevation range where the specimens were collected.
maximumElevationInMetres	Upper limit of the elevation range where the specimens were collected.
verbatimLatitude	Original latitude of the location where the specimens were collected.
verbatimLongitude	Original longitude of the location where the specimens were collected.
verbatimCoordinates	Coordinates of the location where the specimens were collected in their original format.
establishmentMeans	Statement about whether a dwc:Organism has been introduced to a given place and time through the direct or indirect activity of modern humans.
decimalLatitude	Latitude in decimal degrees.
decimalLongitude	Longitude in decimal degrees.
geodeticDatum	The ellipsoid, geodetic datum or spatial reference system (SRS) on which the geographic coordinates provided in decimalLatitude and decimalLongitude are based.
georeferencedBy	List of individuals, groups or organisations that determined the georeference for the location where specimens were collected.
georeferenceSources	List of maps, gazetteers or other resources used to georeference the collection location of the specimens.
georeferenceRemarks	Comments or notes regarding the spatial description.
identifiedBy	List of individuals who identified the specimen(s).
identifiedByID	Identifiers (ORCID or Wikidata) of the people who identified the organism.
identificationRemarks	Comments or notes regarding the identification.
verbatimIdentification	Original identification of the specimen.
identificationQualifier	Degree of uncertainty in the identification, such as aff. (means affine) to the scientific name.
scientificName	Canonical scientific name corresponding to the taxonomic category to which the specimen was identified.
scientificNameAuthorship	Authorship information corresponding to scientificName.
kingdom	Kingdom to which the specimen belongs.
phylum	Phylum to which the taxon belongs.
class	Class to which the taxon belongs.
order	Order to which the taxon belongs.
family	Family to which the taxon belongs.
subfamily	Subfamily to which the taxon belongs.

genus	Genus to which the taxon belongs.
specificEpithe	Specific epithet of the taxon.
taxonRank	Taxonomic category of the name present in scientificName.
vernacularName	Common name of the taxon.
coordinateUncertaintyInMetres	The horizontal distance (in metres) from the given dwc:decimalLatitude and dwc:decimalLongitude describing the smallest circle containing the whole of the dcterms:Location.
eventID	An identifier for the set of information associated with a dwc:Event (something that occurs at a place and time). May be a global unique identifier or an identifier specific to the dataset.
infraspecificEpithet	The name of the lowest or terminal infraspecific epithet of the dwc:scientificName, excluding any rank designation.
taxonomicStatus	The status of the use of the dwc:scientificName as a label for a taxon.
permitTyp (Permit extension)	A permit is a document that allows someone to take an action that otherwise would not be allowed.
permitStatus (Permit extention)	Information about the presence, absence or other basic status of permits associated with the sample(s).
permitText (Permit extension)	The text of a permit related to the gathering/shipping or further details.

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Author contributions

M.A. Bautista-Giraldo and I. Armbrecht came up with the initial project and collected the biological material. M.A. Bautista-Giraldo, E.I. García and R.J. Guerrero performed the taxonomic identification of the ants. M.A. Bautista-Giraldo and E.I. García curated,

digitised and published the datasets used for this paper. All authors contributed to the writing and revision of the various versions of the manuscript.

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